
Interface circuits and protocols

BIPC protocol requirements

The BIPC provides the following capabilities:

- transmits messages originated by either the Meridian 1 or the PMS across the BIPC interface
- overrides PMS originated messages by Meridian 1-originated messages, if the messages are originated simultaneously. Messages are interrupt driven on the Meridian 1 side and protocol driven on the PMS side.
- does not reformat the message body
- uses asynchronous, RS-232-C data handling at up to 9600 baud
- adds one parity bit to each Meridian 1-generated 8-bit data byte
- strips parity bits from the PMS generated data stream
- uses message control (message envelope) characters at the BIPC/PMS interface as defined in [Table 1](#)
- uses interchange protocol, message envelope, and responses at the BIPC/PMS interface as described later

The protocols used between the two data terminals can be classed as follows:

- Link Control to handle the establishment, take down, and maintenance of the data links, and the flow of serial data across the links
- Message Control to handle the exchange of the actual message body across the BIPC interfaces between the two terminals

BIPC initialization

The BIPC is initialized when power is applied, or when the RESET button is pressed. The BIPC sends a carriage return <CR> to the Meridian 1 and waits until it responds with the period (.) prompt character (hex 2E). The BIPC dumps any characters received before the prompt. When the prompt character is received, a flag is set in the BIPC indicating that the Meridian 1 is active. When an Enquiry (ENQ) is received from the PMS, the flag is checked. If the flag is set, the BIPC responds to the PMS with Acknowledged (ACK). If the flag is not set, the BIPC responds with Not Acknowledged (NAK).

Link control

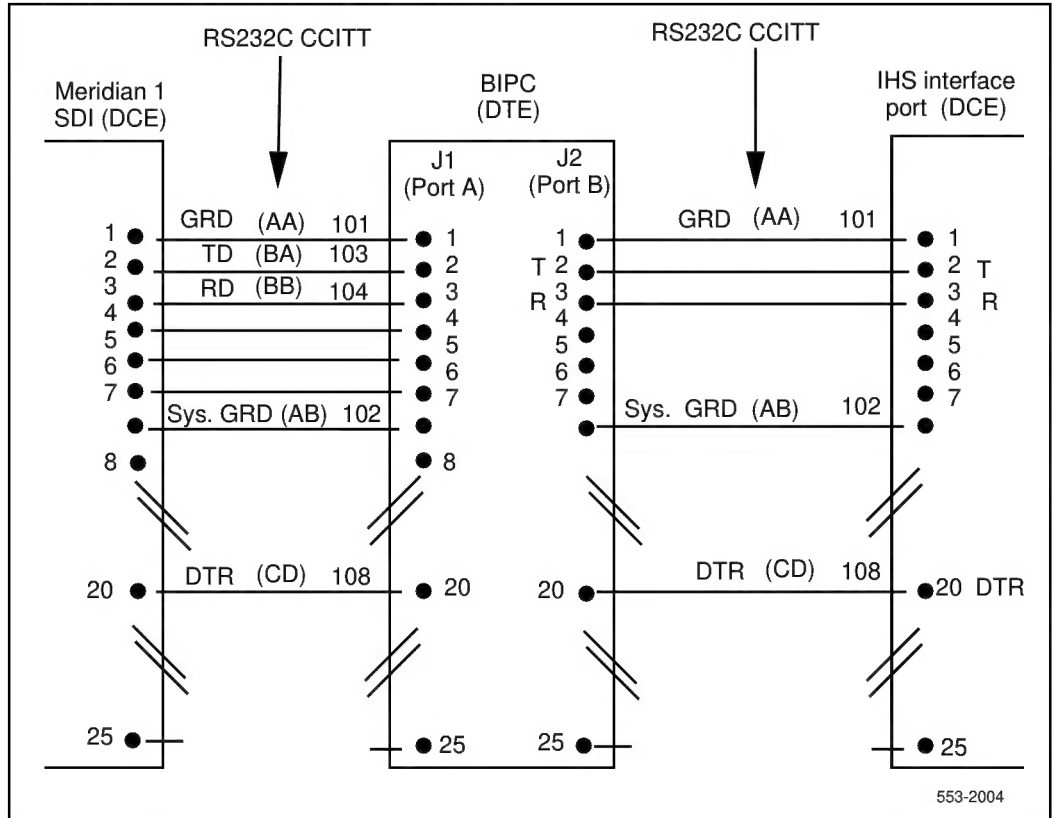
The data interchange between the BIPC and the two data ports (Meridian 1 and PMS) is on data links using RS-232-C link control functions (Figure 5).

The RS-232-C interchange circuits, required at each of the two interface ports, appear in Figure 5. The figure includes RS-232-C, CCITT V.24, and Meridian 1 SDI circuit designations for cross-referencing and to show the functions of the circuits in BIPC operation. For more details on the interchange circuits, refer to the applicable standard (RS-232-C or CCITT V.24).

The Specifications section of this document summarizes the electrical characteristics of the interface circuits for Meridian 1/PMS applications.

Several options provide logical control of the data links. You select the options independently by changing the jumpers on the ports (Figure 14). A PC board layout drawing is necessary for changing the jumpers.

Figure 5
BIPC interface connections and functions



- The following options are available:
- Data Terminal Ready (DTR) (on connector pin 20) is strapped continuously on.
 - Block Character Checks (BCC) is either on or off. With PMS, this option is set on by the factory and is set off only if the PMS cannot use or generate BCC error control.
 - Word format Port A (to the Meridian 1) is always configured for a word format of one start bit, 8 databit, no parity, and 1 stop bit. Port B (to the PMS) word format is switch selectable (switch module SW1). The word format appears in [Figure 6](#). The BIPC is factory set for 7 data bits, even parity, 1 start bit, and 1 stop bit.

Message control

Message envelopes

BIPC/PMS link The envelope for messages between the BIPC and the PMS uses the ASCII-encoded control characters listed in [Table 1](#). In addition, each message block terminates with a Block Character Checks (BCC) character. The BCC maintains message integrity and is an Exclusive-OR of all bytes following the Start of Text (STX), including the End of Text (ETX). The general message format from the sender follows:

ENQ STX (message body) ETX BCC

BIPC/Meridian 1 link The Meridian 1 does not support a message protocol. Messages are simply transmitted into the Meridian 1 when it is ready, as indicated by the prompt character. The input message to the Meridian 1 is Message <CR>, which it echoes back to the BIPC (echoplex). The terminating <CR> indicates the end of a message. The protocol from the Meridian 1 to the BIPC follows:

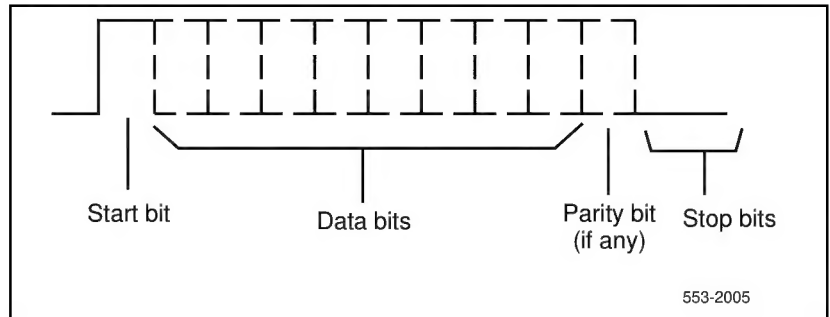
CR	LF	nul	nul	nul	nul	nul	nul	Message Body
CR	LF	nul	nul	nul	nul	nul	nul	Message Body
CR	LF	nul	nul	nul	nul	nul	nul	(prompt)

Note: The number of message lines sent before the prompt depends on the command and the Meridian 1 software.

Message protocol and responses

The BCC follows the End of Text (ETX) character in the transmission, and the receiver immediately performs a verification check. If the BCC is correct, the receiver responds with Acknowledged (ACK). If the BCC does not match, the receiver responds with Not Acknowledged (NAK).

Figure 6
Word format



The port is always configured for 8 data bits, no parity, and 1 stop bit. The PMS port word format is switch selectable.

The sender does not transmit a new message until it either receives an Acknowledged (ACK) response to the previous message, or until it makes three attempts (ENQ) to send the message and receive an ACK. If the required ACK is not received after three tries or within a 20-second delay from the time the ENQ is received, the sender flushes the message.

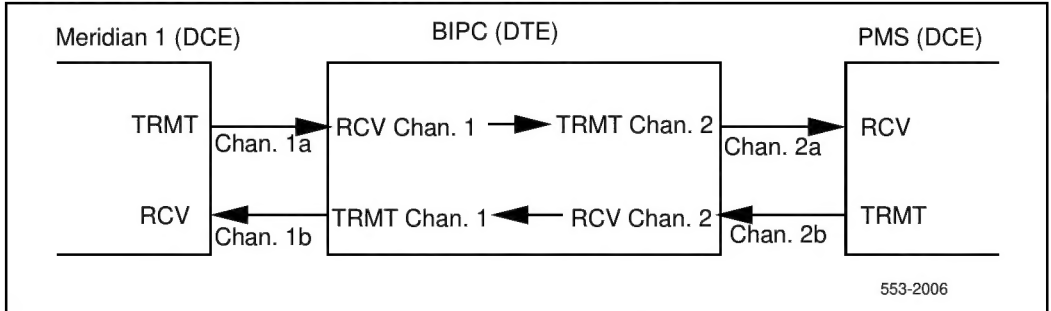
Message priorities

A receiver may not interrupt a transmitter in the middle of a message. If the PMS is sending to the BIPC, the BIPC waits until it has responded with an ACK or Not Acknowledged (NAK) before sending any characters. Similarly, if the BIPC is sending to the PMS, the PMS waits until it responds with ACK or NAK before sending any characters to the BIPC. However, a one-second time out between characters violates the message specifications and allows the receiver to terminate reception of that message.

Table 1
Message control and special character definitions

Character	HEX code	Definitions
Control characters		
ENQ	05	Enquiry: solicits a response from the other terminal — from the sender, asking the receiver if it is ready to receive a message — from the receiver, asking the sender to send or resend a message
STX	02	Start of Text: message body follows
ETX	03	End of Text: end of message body
BCC		Block Character Check (optional)
ACK	06	Acknowledge: affirmative response from the receiver to the sender (if BCC is used, ACK also indicates BCC check matches)
NAK	15	Not-Acknowledged: negative response from the receiver to the sender (for example, not ready to receive a message or a block of data received with errors requires retransmission)
Special characters		
<CR>	0D	carriage return (or equivalent)
If	0A	line feed (or equivalent)
.	2E	ASCII character period (prompt character for Meridian 1)
00	00	Null (nu) character
xx		represents any hex number

Figure 7
BIPC connection diagram with communication channels



Examples

The examples appearing in **Figures 8** through **12** illustrate applications of the message protocols under both normal and error conditions. The diagram in **Figure 7** illustrates the message channels implied in these examples:

- Figure 8** Valid transaction example
 (message from PMS to Meridian 1)
- Figure 9** Invalid format example
 (control character in message body from PMS to BIPC)
- Figure 10** Transaction with error example
 (BCC mismatch in the BIPC to PMS message)
- Figure 11** Valid transaction example
 (single message from Meridian 1 to PMS)
- Figure 12** Valid transaction example
 (multiple messages from Meridian 1 to BIPC)

Figure 8
Valid transaction example (message from PMS to Meridian 1)

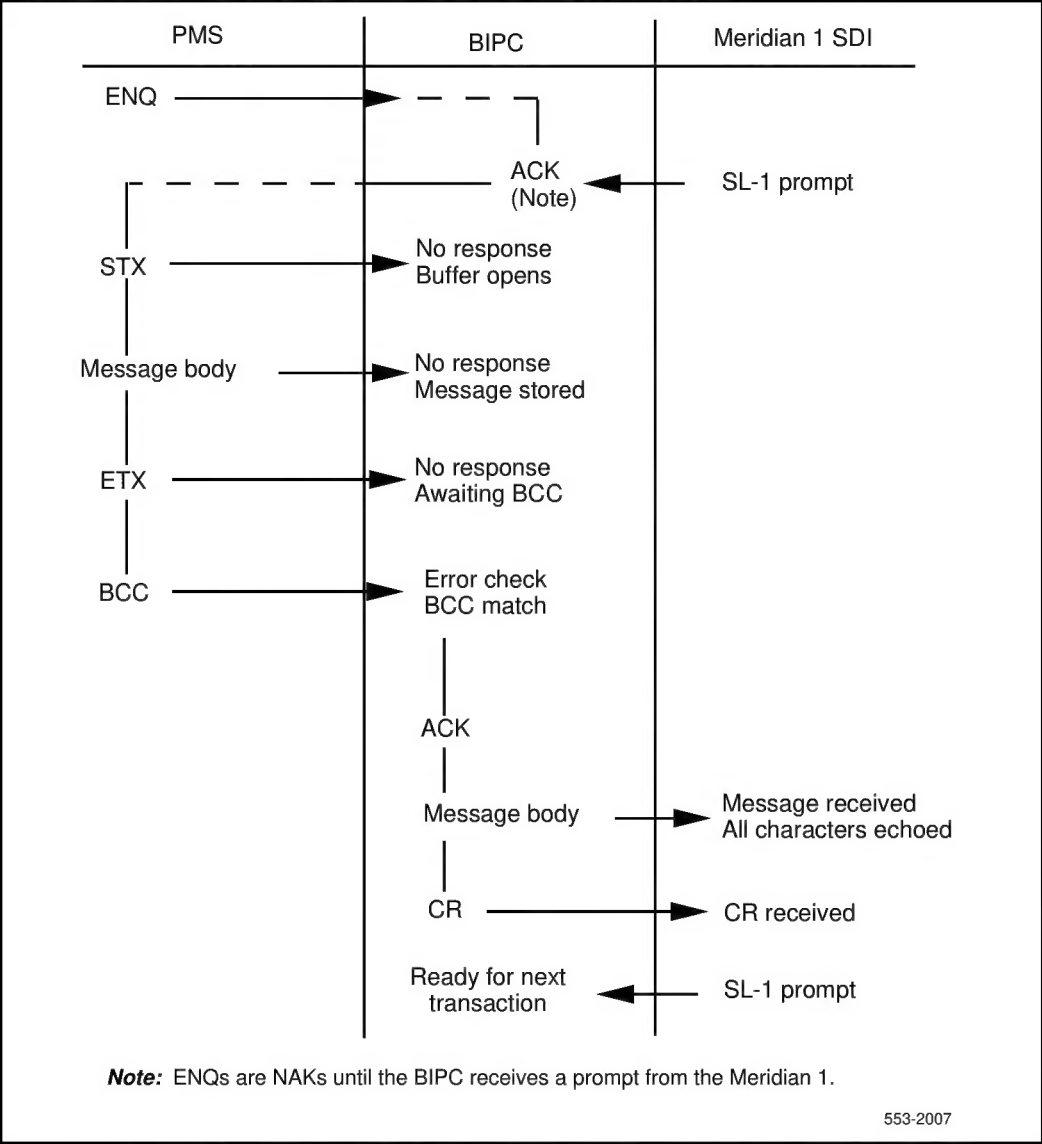


Figure 9
Invalid format example (control character in message body)

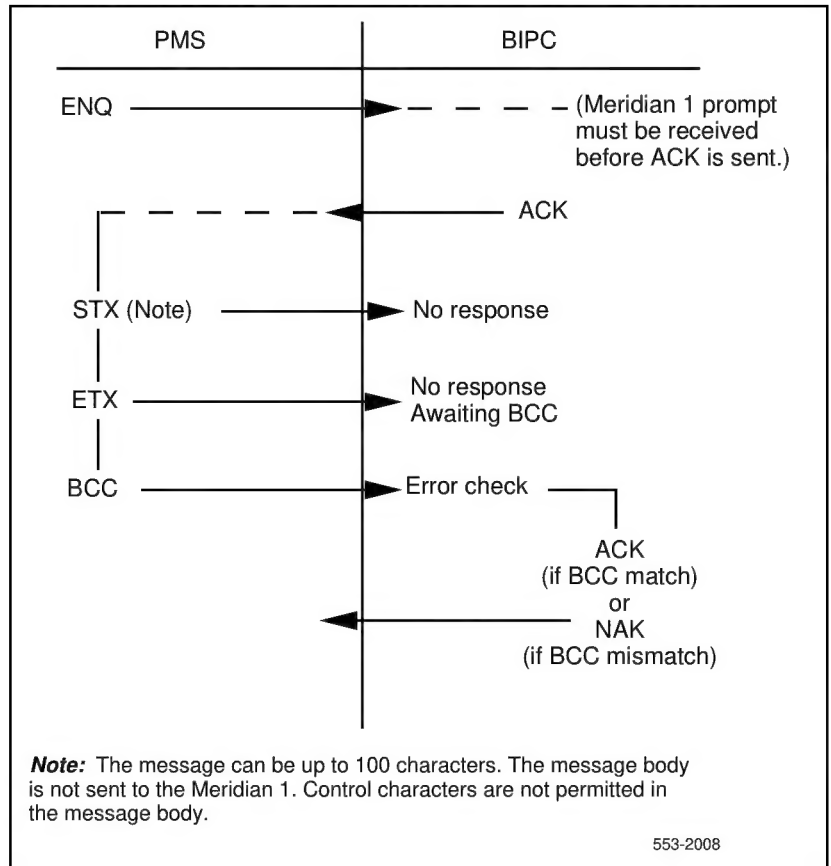


Figure 10
Transaction with error (BCC mismatch in the BIPC to PMS message)

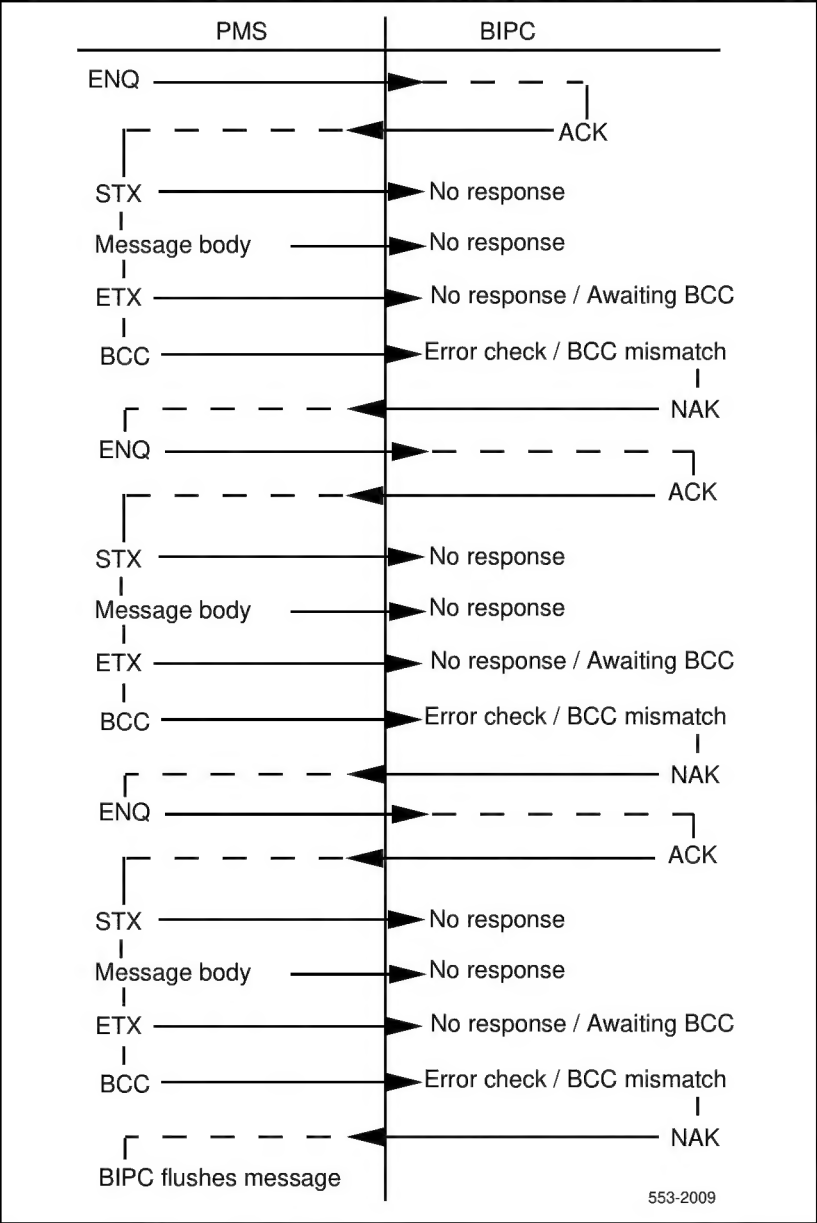


Figure 11
Valid Transaction (a single message from Meridian 1 to PMS)

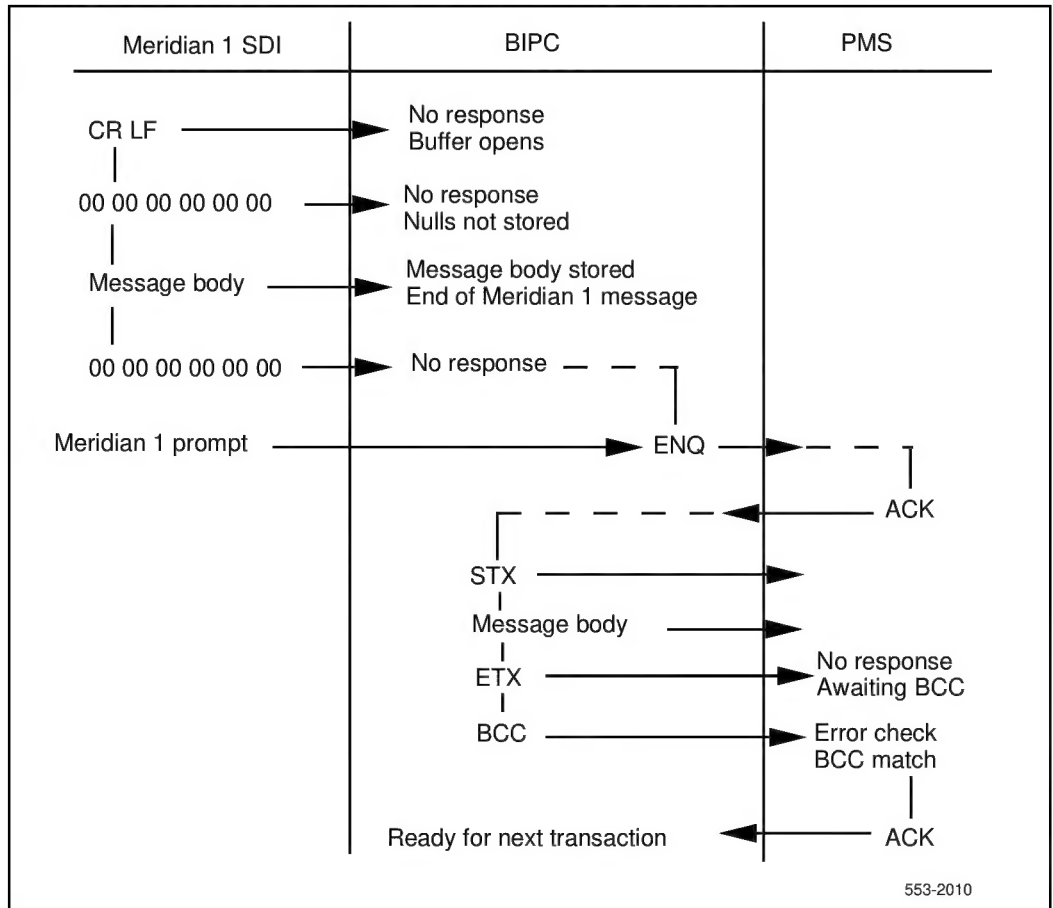


Figure 12
Valid Transaction (multiple messages from Meridian 1 to BIPC)

